AP/TC

TRANSMITTAL OF APPEAL BRIEF (Large Entity)	Docket No. ITL.1093US

In Re Application Of: **John R. Harrison, et al.**

OIPE JAN 08 2008 PATENT & TRADEMARK OFFICE

Application No.	Filing Date	Examiner	Customer No.	Group Art Unit	Confirmation No.
10/798,757	March 11, 2004	David H. Malzahn	47795	2193	6402

Invention: **Computing Transcendental Functions Using Single Instruction Multiple Data (SIMD) Operations**

COMMISSIONER FOR PATENTS:

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Dated: **January 4, 2008**

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Applicant:		§		
	John R. Harrison, et al.	§	Art Unit:	2193
		§		
Serial No.:	10/798,757	§	Examiner:	David H. Malzahn
		§		
Filed:	March 11, 2004	§	Atty Docket:	ITL.1093US
		§		(P18487)
For:	Computing Transcendental Functions Using Single Instruction Multiple Data (SIMD) Operations	§	Assignee:	Intel Corporation

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APPEAL BRIEF

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Nancy Meshkoff

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REAL PARTY IN INTEREST

The real party in interest is the assignee Intel Corporation.

RELATED APPEALS AND INTERFERENCES

None.

STATUS OF CLAIMS

Claim 1 (Rejected).

Claim 2 (Canceled).

Claims 3-12 (Rejected).

Claim 13 (Canceled).

Claims 14-22 (Rejected).

Claims 1, 3-12, and 14-22 are rejected and are the subject of this Appeal Brief.

STATUS OF AMENDMENTS

The Reply to Final Rejection submitted on October 9, 2007 contained no amendments to the claims. All amendments have therefore been entered.

SUMMARY OF CLAIMED SUBJECT MATTER

In the following discussion, the independent claims are read on one of many possible embodiments without limiting the claims:

1. A method comprising:

reducing an input argument x of a function to a range reduced value r according to a first reduction sequence (Figure 1, 20; Specification at p. 5, lines 9-10);

approximating a polynomial for a corresponding function of r having a dominant portion $f(A)+\sigma r$ where A equals x minus r, and an absolute value of σ is a power of two (Figure 1, 30; Specification at p. 5, lines 11-13); and

executing a single instruction multiple data floating point operation to obtain a first result for the function using the polynomial (Figure 1, 40; Specification at p. 5, lines 16-18).

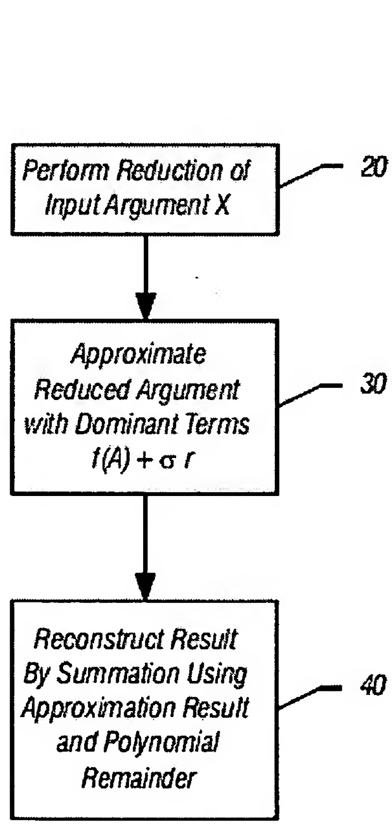

FIG. 1

12. An article comprising a machine-accessible storage medium containing instructions that if executed enable a system to:

reduce an input argument x of a function to a range reduced value r according to a first reduction sequence (Figure 1, 20; Specification at p. 5, lines 9-10);

approximate a polynomial for a corresponding function of r having a dominant portion $f(A)+\sigma r$ where A equals x minus r, and an absolute value of σ is a power of two (Figure 1, 30; Specification at p. 5, lines 11-13); and

execute a single instruction multiple data floating point operation to obtain a first result for the function using the polynomial (Figure 1, 40; Specification at p. 5, lines 16-18).

18. A system comprising:

a processor (Figure 3, 410); and

a dynamic random access memory (Figure 3, 420) coupled to the processor including instructions that if executed enable the system to reduce an input argument x of a function to a range reduced value r according to a first reduction sequence (Figure 1, 20; Specification at p. 5, lines 9-10), approximate a polynomial for a corresponding function of r having a dominant portion $f(A)+\sigma r$ where A equals x minus r, and an absolute value of σ is a power of two (Figure 1, 30; Specification at p. 5, lines 11-13), and execute a single instruction multiple data floating point operation to obtain a first result for the function using the polynomial (Figure 1, 40; Specification at p. 5, lines 16-18).

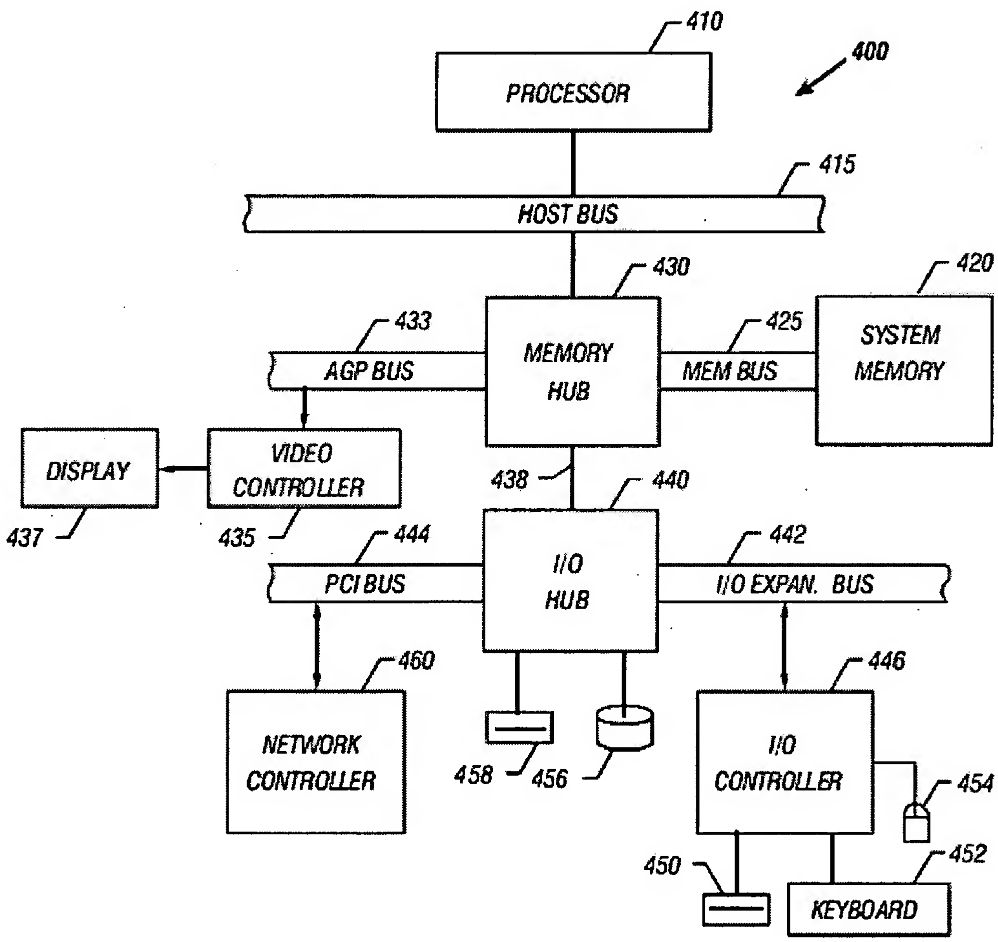

FIG. 3

At this point, no issue has been raised that would suggest that the words in the claims have any meaning other than their ordinary meanings. Nothing in this section should be taken as an indication that any claim term has a meaning other than its ordinary meaning.

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

A. Whether claims 1, 3-12, and 14-22 are unpatentable under 35 U.S.C. § 101 as being directed towards non-statutory subject matter.

ARGUMENT

A. Are claims 1, 3-12, and 14-22 are unpatentable under 35 U.S.C. § 101 as being directed towards non-statutory subject matter?

Claim 1 calls for "executing a single instruction multiple data floating point operation". It is not seen how this possibly could be a mathematical operation.

Necessarily, it is a computer operation, and a well-known one. SIMD or single-instruction, multiple-data stream processing is a well-known category of parallel processor computer architecture. The one-instruction processor fetches instructions and distributes orders to several other processors. *See* the attached definition from Microsoft's dictionary.

Thus, executing requires something other than math. A single-instruction, multiple-data point floating point operation is not math but is a computer operation that is a standard kind of operation in computers. Therefore, application to pure mathematics is precluded.

Applicant respectfully requests that each of the final rejections be reversed and that the claims subject to this Appeal be allowed to issue.

Respectfully submitted,

Date: January 4, 2008

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CLAIMS APPENDIX

The claims on appeal are:

1. A method comprising:

reducing an input argument x of a function to a range reduced value r according to a first reduction sequence;

approximating a polynomial for a corresponding function of r having a dominant portion $f(A)+\sigma r$ where A equals x minus r, and an absolute value of σ is a power of two; and

executing a single instruction multiple data floating point operation to obtain a first result for the function using the polynomial.

3. The method of claim 1, wherein approximating the polynomial comprises performing a plurality of successive addition/subtraction operations.

4. The method of claim 1, wherein approximating the polynomial comprises using a lookup table to obtain a breakpoint for f(A).

5. The method of claim 1, further comprising restricting the input argument x to values within a predetermined window.

6. The method of claim 1, further comprising restricting the input argument x to values between 2^{-252} and 90112.

7. The method of claim 1, wherein obtaining the first result for the function comprises obtaining sin(x).

8. The method of claim 7, further comprising obtaining a second result for the function using a second input y, wherein y is $\pi/2$ greater than x.

9. The method of claim 8, wherein obtaining the second result for the function comprises obtaining cos(x).

10. The method of claim 9, further comprising obtaining sin(x) and cos(x) using a single instruction multiple data (SIMD) floating-point operation.

11. The method of claim 9, further comprising obtaining the first result and the second result in parallel.

12. An article comprising a machine-accessible storage medium containing instructions that if executed enable a system to:

reduce an input argument x of a function to a range reduced value r according to a first reduction sequence;

approximate a polynomial for a corresponding function of r having a dominant portion $f(A)+\sigma r$ where A equals x minus r, and an absolute value of σ is a power of two; and

execute a single instruction multiple data floating point operation to obtain a first result for the function using the polynomial.

14. The article of claim 12, further comprising instructions that if executed enable the system to approximate the polynomial using a lookup table to obtain a breakpoint for f(A).

15. The article of claim 12, further comprising instructions that if executed enable the system to obtain a second result for the function equal to cos(x), wherein the first result is equal to sin(x).

16. The article of claim 15, further comprising instructions that if executed enable the system to obtain sin(x) and cos(x) using a single instruction multiple data (SIMD) floating-point operation.

17. The article of claim 15, further comprising instructions that if executed enable the system to obtain the first result and the second result in parallel.

18. A system comprising:

a processor; and

a dynamic random access memory coupled to the processor including instructions that if executed enable the system to reduce an input argument x of a function to a range reduced value r according to a first reduction sequence, approximate a polynomial for a corresponding function of r having a dominant portion $f(A)+\sigma r$ where A equals x minus r, and an absolute value of σ is a power of two, and execute a single instruction multiple data floating point operation to obtain a first result for the function using the polynomial.

19. The system of claim 18, wherein the dynamic random access memory further includes instructions that if executed enable the system to obtain a second result for the function equal to cos(x), wherein the first result is equal to sin(x).

20. The system of claim 19, wherein the dynamic random access memory further includes instructions that if executed enable the system to obtain sin(x) and cos(x) using a single instruction multiple data (SIMD) floating-point operation.

21. The system of claim 20, wherein the dynamic random access memory further includes instructions that if executed enable the system to obtain sin(x) and cos(x) using a single instruction multiple data (SIMD) floating-point operation when a function call requests either of sin(x) or cos(x).

22. The system of claim 20, wherein the dynamic random access memory further includes instructions that if executed enable the system to obtain the first result and the second result in parallel.

EVIDENCE APPENDIX

See definition of "SIMD", Microsoft Press Computer Dictionary, Third Edition (1997), on the following pages.

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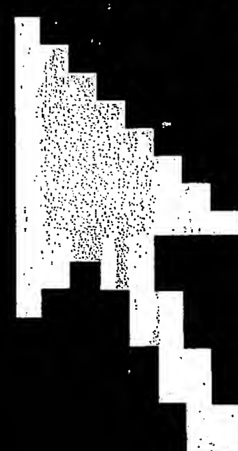

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Microsoft® Press

PUBLISHED BY
Microsoft Press
A Division of Microsoft Corporation
One Microsoft Way
Redmond, Washington 98052-6399

Library of Congress Cataloging-in-Publication Data
Microsoft Press Computer Dictionary. -- 3rd ed.
p. cm.
ISBN 1-57231-446-X
1. Computers--Dictionaries. 2. Microcomputers--Dictionaries.
I. Microsoft Press.
QA76.15.M54 1997
004'.03--dc21 97-15489
CIP

Printed and bound in the United States of America.

2 3 4 5 6 7 8 9 QMQM 2 1 0 9 8 7

Distributed to the book trade in Canada by Macmillan of Canada, a division of Canada Publishing Corporation.

A CIP catalogue record for this book is available from the British Library.

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sign on \sīn on´\ *vb. See* log on.

sign propagation \sīn´ prop-ə-gā`shən\ *n. See* sign bit.

silica gel \sil´i-kə jel`\ *n.* A desiccant (moisture-absorbent substance) often packaged with optical or electronic equipment.

silicon \sil´i-kon`\ *n.* A semiconductor used in many devices, especially microchips. Silicon, with atomic number 14 and atomic weight 28, is the second most common element in nature.

silicon chip \sil´i-kon chip`\ *n.* An integrated circuit that uses silicon as its semiconductor material.

silicon-controlled rectifier \sil`i-kon-kən-trōld rek´tə-fī-yər\ *n.* A semiconductor rectifier whose conductance can be controlled by a gate signal. *Acronym:* SCR (S`C-R´). *See also* gate (definition 1), rectifier.

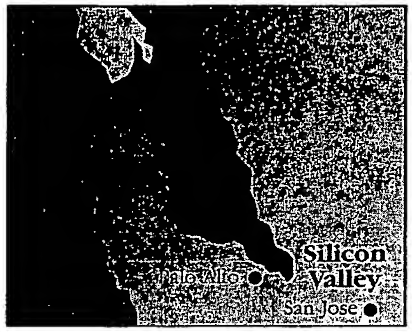
silicon dioxide \sil`i-kon dī-oks´īd\ *n.* An insulator used to form thin insulating layers in some types of semiconductors; also the primary component of glass.

silicone \sil´i-kōn\ *n.* A polymer in which silicon and oxygen are major components. Silicone is an excellent electrical insulator and conducts heat well.

silicon foundry \sil´i-kon foun`drē\ *n.* A factory or machine used to create wafers of crystalline silicon.

silicon-on-sapphire \sil`i-kon-on-saf´īr\ *n.* A method of fabricating semiconductors in which the semiconductor devices are formed in a thin single layer of silicon that has been grown on an insulating substrate of synthetic sapphire. *Acronym:* SOS (S`O-S´).

Silicon Valley \sil`i-kon val´ē\ *n.* The region of California south of San Francisco Bay, otherwise known as the Santa Clara Valley, roughly extending from Palo Alto to San Jose. Silicon Valley is a major center of electronics and computer research, development, and manufacturing. See the illustration.

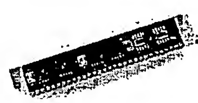


Silicon Valley.

SIM \S`I-M´\ *n. See* Society for Information Management.

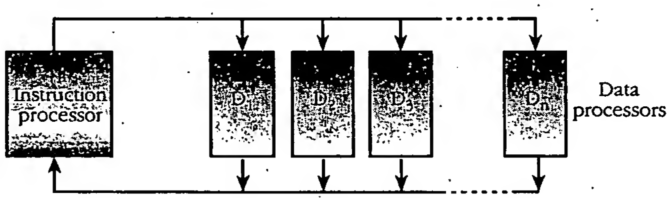
SIMD \S`I-M-D´\ *n.* Acronym for single-instruction, multiple-data stream processing. A category of parallel-processor computer architecture in which one instruction processor fetches instructions and distributes orders to several other processors. See the illustration. *See also* parallel processing. *Compare* MIMD.

SIMM \sim, S`I-M-M´\ *n.* Acronym for single inline memory module. A small circuit board designed to accommodate surface-mount memory chips. See the illustration.



SIMM.

Simple Mail Transfer Protocol \sim`pl māl` trans-fər prō´tə-kol\ *n.* A TCP/IP protocol for sending messages from one computer to another on a network. This protocol is used on the Internet to route e-mail.



SIMD.

RELATED PROCEEDINGS APPENDIX

None.